Fire Effects Information System (FEIS)

FEIS Home Page

Index of Species Information

SPECIES: Taxus brevifolia

Introductory

SPECIES: Taxus brevifolia

AUTHORSHIP AND CITATION :
Tirmenstein, D. A. 1990. Taxus brevifolia. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.fed.us/database/feis/plants/tree/taxbre/all.html [2020, December 3].

ABBREVIATION :
TAXBRE

SYNONYMS :
Taxus baccata var. brevifolia
Taxus baccata ssp. brevifolia
Taxus boursieri
Taxus lindleyana

SCS PLANT CODE :
TABR2

COMMON NAMES :
Pacific yew
western yew
yew brush
yew
mountain mahogany

TAXONOMY :
The currently accepted scientific name of Pacific yew is Taxus brevifolia Nutt. [36]. Pacific yew is a member of the family Taxaceae [29].

LIFE FORM :
Tree, Shrub

FEDERAL LEGAL STATUS :
No special status

OTHER STATUS :
NO-ENTRY

DISTRIBUTION AND OCCURRENCE

SPECIES: Taxus brevifolia

GENERAL DISTRIBUTION :
Pacific yew grows along the Pacific Coast of southeastern Alaska southward through western British Columbia to central California [46,55]. In the Rocky Mountain region, it occurs from southeastern British Columbia through northwestern Montana and northern Idaho into eastern Washington and Oregon [46].

Dense stands of shrubby Pacific yew dominate approximately 40,000 acres (16,000 ha) in the South Fork of the Clearwater Drainage of north-central Idaho [14]. This plant has been essentially eliminated from another 9,880 acres (4,000 ha) by timber harvest [14].

ECOSYSTEMS :

FRES20 Douglas-fir
FRES21 Ponderosa pine
FRES22 Western white pine
FRES23 Fir - spruce
FRES24 Hemlock - Sitka spruce
FRES25 Larch
FRES27 Redwood

STATES :

AK CA ID MT OR WA BC

BLM PHYSIOGRAPHIC REGIONS :

1 Northern Pacific Border
2 Cascade Mountains
4 Sierra Mountains
8 Northern Rocky Mountains

KUCHLER PLANT ASSOCIATIONS :

K001 Spruce - cedar - hemlock forest
K002 Cedar - hemlock - Douglas-fir forest
K003 Silver fir - Douglas-fir forest
K005 Mixed conifer forest
K006 Redwood forest
K007 Red fir forest
K012 Douglas-fir forest
K013 Cedar - hemlock - pine forest
K014 Grand fir - Douglas-fir forest
K015 Western spruce - fir forest
K029 California mixed evergreen forest

SAF COVER TYPES :

206	Engelmann spruce - subalpine fir
207	Red fir
211	White fir
212	Western larch
213	Grand fir
215	Western white pine

SRM (RANGELAND) COVER TYPES :
NO-ENTRY

HABITAT TYPES AND PLANT COMMUNITIES :
Pacific yew grows as an understory dominant or codominant in a number of coniferous forests of the Pacific Northwest and northern Rocky Mountains. Overstory dominants include grand fir (Abies grandis), white fir (Abies concolor), and western hemlock (Tsuga heterophylla). Vine maple (Acer circinatum), queencup beadlily (Clintonia uniflora), and wild ginger (Asarum caudatum) are common codominants. In parts of northern Idaho, Pacific yew grows as a climax dominant which forms a nearly contiguous shrublike overstory. It is listed as an indicator or dominant in the following habitat type (hts), community type (cts), and plant association (pas) classification schemes:

Area	Classification	Authority
CA	mixed evergreen cts	Sawyer and others 1977
CA, OR: Siskiyou Mtn. Province	forest pas	Atzet and Wheeler 1984
CA, OR: e Siskiyous	forest cts	Waring 1969
n ID	forest cts, hts	Cooper and others 1987
OR: Abott Creek RNA	forest cts	Mitchell and Moir 1976
s OR: Cascade Mtns.	forest pas	Atzet and McCrimmon 1990
OR, ID: Wallowa-Whitman NF	general veg. pas	Johnson and Simon 1987
n Rocky Mountains	Pacific yew cts	Crawford and Johnson 1985

MANAGEMENT CONSIDERATIONS

SPECIES: Taxus brevifolia

WOOD PRODUCTS VALUE :
The nonresinous wood of Pacific yew is fine grained, heavy, hard, and very strong [5,32,55,62]. It is elastic but very durable, and resists decay [5,32]. The sapwood is light yellow and thin, and the heartwood is bright orange or rose red [5]. The wood responds well to finishing and turns well on lathes [5,30]. This attractive wood has been used to make canoe paddles, tool handles, poles, and fence posts [32,62]. It is sometimes used in carving, cabinet-making, and for turned articles [5,65] but has little or no commercial importance [30,32].

Native Americans traditionally used Pacific yew for constructing harpoons, spear handles, eating utensils, wedges, paddles, and clubs used in battle and for hunting seals [5]. Pacific yew is renowned for its value in making bows and was formerly referred to as "bow plant" by the Salish people [75]. Bows made from Pacific yew tended to be broad, short, and flat [80]. Pacific yew is still used to craft some of the finest archery bows. The best bows are made from wood which has been cured for several decades [5] and are, not surprisingly, quite costly.

IMPORTANCE TO LIVESTOCK AND WILDLIFE :
Pacific yew provides important food and cover for many wildlife species

[34,68]. Old-growth grand fir/Pacific yew forests are often considered critical moose winter habitat [61].

Browse: Many wild ungulates feed on Pacific yew including deer, elk, and moose [14,21,49]. In parts of northern Idaho, it is a preferred winter moose browse [14]. Although Pacific yew browse may be eaten during all seasons, use is particularly heavy in fall, winter, and spring [14,60,61]. In winter, moose eat available forage and bark which they strip from trees [14]. Plants may be severely hedged in some areas [60]. Use is typically greatest when other forage is buried by snow [60]. Moose utilization by season has been documented as follows [60]:

	percent aggregate use
May - July	3
July- September	0
October - November	42
December - April	41

In a winter study at a Connecticut nursery, as much as 77.1 percent of all Pacific yew shoots were browsed by white-tailed deer [12]. Rabbits and other small herbivores may also browse Pacific yew in many areas [21].

Pacific yew is reportedly toxic to domestic livestock [65,77], but conclusive evidence of toxicity is lacking [15,37]. The closely related English yew (Taxus baccata) is poisonous to cattle, horses, sheep, rabbits, and man [66]. Some researchers report that Pacific yew is similarly toxic, particularly when cut, piled, and allowed to rot [32]. However, in many areas livestock appear to browse branches "with impunity" [70]. Livestock use is generally limited to the winter months or periods of food scarcity [15].

Fruit: Fruit of Pacific yew is sweet but reportedly poisonous to some species [70]. It is readily eaten by many species of songbirds including the Townsend's solitaire, varied thrush, and hermit thrush [34]. The ring-tailed cat also feeds on the fruit of Pacific yew [77].

Foraging sites: Pacific yew snags may be used by foraging woodpeckers [48].

PALATABILITY :
Foliage of Pacific yew is at least somewhat palatable to many large ungulates and is highly palatable to moose, particularly during the fall and winter [14,60]. Fruit is highly palatable to many species of small birds and mammals [5,77].

NUTRITIONAL VALUE :
NO-ENTRY

COVER VALUE :
Pacific yew commonly forms a dense subcanopy which provides excellent hiding and thermal cover for large ungulates and other wildlife species [34,68]. On riparian sites, it provides shade which maintains cool water temperatures for salmonids and other anadromous fish [68].

VALUE FOR REHABILITATION OF DISTURBED SITES :
Potential rehabilitation value of Pacific yew is unknown. However, plants can be easily propagated from cuttings [5,42] or seed [65]. Cleaned seed averages approximately 17,600 per pound (39/g) [65]. Techniques for propagation from seed have been examined in detail

[21,28,65].

The fibrous root system of Pacific yew can aid in stabilizing stream channels [68].

OTHER USES AND VALUES :
Pacific yew is an attractive ornamental which is frequently used as a hedge plant [65]. It was first cultivated in 1854 [65]. According to Kruckeberg [42], only the best foliage forms of Pacific yew can compare with the much more widely planted English yew. A shrubby form of Pacific yew, often associated with serpentine soils, is generally considered the most desirable ornamental form [42]. Once established in the garden, Pacific yew grows well in partial shade or full sun [42].

Some Native American peoples traditionally associated Pacific yew with death and bereavement [32,75]. The fragrant foliage was used as a deodorant and cleaning agent [75]. Tonics made from Pacific yew were used medicinally by many peoples of the Pacific Northwest [75]. Although seeds are poisonous, the fleshy portions surrounding them were sometimes eaten [75]. The supple, stringy underbark was sometimes used for braiding and weaving various items [32].

Taxol, a substance obtained from the bark of Pacific yew [33], has inhibited the growth of various types of cancer cells in experimental tests [1,44]. Clinical trials indicate that taxol produces a definite but limited activity against metastatic melanoma and some types of leukemia [44]. It may also be useful in treating ovarian cancer and in inhibiting the growth of carcinosarcoma cells [11,44,38]. Taxol inhibits the replication of Trypanosoma cruzi, a pathogenic protozoan which causes Chagas disease [11], as well as the disease-causing flagellate Trichomonas vaginalis [35].

Researchers are currently working on methods to synthesize taxol in the laboratory, but efforts to date have been only partially successful [39]. Pacific yew yields more taxol than any other species of yew (Taxus spp.) and remains the primary source of this substance [11]. Recent experiments suggest that it may soon be possible to obtain taxol from the leaves rather than from the bark [39].

OTHER MANAGEMENT CONSIDERATIONS :
Timber harvest: Pacific yew is uncommon on most recently harvested sites [81]. It is sensitive to drastic changes in light and temperature and can be severely harmed by increasing exposure to heat after tree canopy removal [34]. Sensitivity to frost may also cause decreases in yew after overstory removal [11]. Plants commonly turn orange or brown, and the foliage dies back after clearcutting [5,11,49]. However, Pacific yew often adapts to unshaded conditions through changes in twig distribution and leaf morphology [11]. In a northern Idaho study, approximately 78 percent of individual plants survived overstory removal [11].

Reductions in the cover of Pacific yew are often dramatic. Antos [2] reported 1.4 percent cover after grand fir types were clearcut in western Montana. Prior to timber harvest, Pacific yew represented nearly 20 percent cover. The effects of timber harvest have been examined in a number of studies [4,18,19]. Uneven-aged individual tree removal or group selection is much less damaging to yew than clearcutting [34]. Broadcast burning also greatly reduces the cover of Pacific yew [61].

Wildlife: In parts of northern Idaho, moose browse Pacific yew heavily during winter. Browse in clearcuts is generally covered by deep snow and inaccessible to moose. However, plants within the understory of old-growth forests are readily accessible and heavily utilized [60]. Clearcutting in these areas does not favor moose. For best moose habitat, timber harvest should be avoided in old-growth grand fir/Pacific yew communities [61]. To protect Pacific yew and maintain adequate moose browse, whole tree removal should be used where possible to lessen the need for slash disposal [61]. Slash should be piled and then burned rather than broadcast burned. Natural grand fir and Engelmann spruce (Picea engelmannii) regeneration can be supplemented by planting Douglas-fir (Pseudotsuga menziesii) in small clearings [61].

Damage: Pacific yew may be severely damaged by rabbits and deer [21]. Moose occasionally kill trees by girdling the trunk [14]. In some locations ungulates can hedge or even remove Pacific yew from springs and seeps [14]. In parts of northern Idaho, heavy moose browsing can prevent Pacific yew dominance on ridges and south aspects [14]. In some areas, yew regeneration can be significantly impacted by moose [14].

Pacific yew is resistant to damage from sulfur dioxide pollution [11] and is resistant to insects and disease [50].

Allelopathy: Seedlings of other species are rarely found beneath yews [49]. Pacific yew has exhibited inhibition both in laboratory experiments and in the field [16,64]. Allelopathic compounds may be concentrated in senescent leaves and leached into the litter [64].

Bark collection: Approximately 20,000 pounds (9,080 kg) of bark is required to produce 2.2 pounds (1 kg) of taxol [1]. In some locations, populations of Pacific yew are threatened by collectors gathering bark for its anticancer properties [68]. If this demand continues, this important species could become scarce in many areas [11].

Old growth indicator: Scher and Jimerson [68] noted that long-lived temperature-sensitive species such as Pacific yew may serve as useful indicators of old-growth forests.

BOTANICAL AND ECOLOGICAL CHARACTERISTICS

SPECIES: Taxus brevifolia

GENERAL BOTANICAL CHARACTERISTICS :

Pacific yew is a slow-growing evergreen shrub or tree which commonly reaches 20 to 40 feet (6-12 m) at maturity [65,68]. On favorable coastal lowland sites, scattered individuals can grow to 60 feet (18 m) in height and have diameters of 2 to 3 feet or more (016-0.9 m) [5]. On poor sites, such as those at higher elevations, Pacific yew grows as a large sprawling shrub [62]. This large shrub or tree can reach maturity at 250 to 350 years of age [62] and often survives for several centuries [5].

Pacific yew is characterized by a conical crown and slender, drooping horizontal branchlets [32,55]. The trunk is limby and often contorted or malformed [29,32,62]. Twigs are slender, hairless and green, but become dark reddish brown in the second growing season [32]. Bark is very thin (approximately 0.25 inch [64 mm]), scaly, with purplish outer scales covering newly formed reddish or purplish inner bark [30,32,62]. The root system is fibrous [68].

The sharp-pointed leaves are linear to lanceolate, 0.5 to 1 inch (1-3 cm) long, and spirally arranged [32,55,62]. Leaves are dark yellow-green above and paler beneath [30,55]. Leaves persist for at least 5 to 6 years [30,62].

Pacific yew is dioecious [30]. Globose, yellowish staminate cones approximately 0.12 inch (3mm) in length are produced in abundance on male plants [11,30]. Single, greenish, ovulate cones are borne on the lower sides of branches [30,62]. Fruit is a red, fleshy, ovoid, berrylike aril [30,55]. Each fruit is approximately 0.4 inch (1 cm) in length and matures in one season [62]. The cup-shaped fruit surrounds a large single, naked seed [30,70]. The seed is reddish, obvoid-oblong, with a hard bony shell exposed at the apex [29,62].

RAUNKIAER LIFE FORM :
Phanerophyte

REGENERATION PROCESSES :
Pacific yew can establish beneath a closed forest canopy by seed or by vegetative means [49]. In many areas, layering is the primary mode of reproduction, but seedlings are also common on some sites [2].

Seed: Most species of yew (Taxus spp.) produce at least some seed annually [65]. Seeds can remain viable for 5 or 6 years if properly stored [65]. Conclusive evidence is lacking, but some researchers have suggested that seed may be stored in the soil [31]. Seed is commonly dispersed by birds, and some long-distance transport is possible [50]. Passage through avian digestive tracts may affect seed dormancy [11].

Germination: Seeds of Pacific yew have a "strong but variable" dormancy [65] and generally require stratification before germination can begin [53]. In laboratory experiments, seeds germinated well after prolonged warm and cold stratification [65]. Seed can be planted 0.4 to 0.5 inch (10-13 mm) in depth and subjected to alternating day (86 degrees Fahrenheit [30 deg C]) and night (68 degrees Fahrenheit [20 deg C]) temperatures for at least 28 days. However, even when properly treated, some seed may not germinate until the second spring. Results of an experimental test were as follows [65]:

stratification		temp.		duration	germ. capacity	
warm	cold	day	night	(days)	(avg. %)	(range)
---	---	86 F	68 F	60	55	50-99

In other laboratory tests, average germination ranged from 50 to 60 percent [77]. Under natural conditions, germination may not take place until the second year [65].

Seedling establishment: Seedling establishment is generally more favorable beneath a canopy than in canopy gaps [14]. Means [52] observed seedling densities of 0.4 per acre (1/ha) in gaps but noted 47 per acre (115/ha) beneath a canopy in the western Cascades of Oregon. Seedlings are reportedly uncommon in undisturbed situations but are often abundant in partially cut areas where yew is present [11].

Vegetative regeneration: Branches and stems of Pacific yew commonly root when in contact with the soil [14,49]. Plants are generally unharmed after being flattened by large conifers during canopy break-up [14,49]. Crushed yews often form a series of layered branches that give rise to numerous individual plants [14,49]. Regeneration of Pacific yew is favored by falling debris [49]. Layering enables Pacific yew to quickly expand into gaps created as senescent conifers fall. Sprouts generally develop from cut or broken stumps [14]; epicormic branching is also common [11].

SITE CHARACTERISTICS :
Pacific yew grows in a variety of cool and moist shaded habitats in coastal lowlands and mountains [5,30,32]. It occurs in canyon bottoms,

on moist forested flats near streams, and scattered at various upland sites [14,30,32]. At middle elevations in northern Idaho, it forms a dense tangle of shrubs approximately 10 to 15 feet (3-5 m) in height. Elsewhere, small groups or scattered individuals are more common [5,11]. Pacific yew grows on dry, rocky sites and in avalanche chutes west of the Cascades [5]. However, it is commonly found in warm, humid concavities [82]. Pacific yew is the most shade tolerant tree in the Pacific Northwest [62]. In less humid climates, it may actually require shade [41].

Plant communities: Pacific yew commonly grows beneath the dense shade of western hemlock, Douglas-fir, and Pacific silver fir (Abies amabilis) forests [5,68]. Although most often associated with relatively moist plant associations dominated by western hemlock, Sitka spruce (Picea sitchensis), and Pacific silver fir, it also occurs in relatively moist microsites beneath species more typically associated with drier sites such as ponderosa pine (Pinus ponderosa), incense cedar (Calocedrus decurrens), Oregon white oak (Quercus garryana), Jeffrey pine (Pinus jeffreyi), and knobcone pine (P. attenuata) [11,55,68]. In parts of eastern Oregon and California, Pacific yew is a prominent component of white fir forests [11,54]. In northern California and southwestern Oregon, it is common in mixed evergreen forests dominated by white fir, Douglas-fir, canyon live oak (Quercus chrysolepis), chinkapin (Chrysolepis chrysophylla), and Pacific madrone (Arbutus menziesii) [6,7,55,82]. At the extreme southern edge of its range, Pacific yew grows beneath sequoia (Sequoia sempervirens) [11,27]. In the northern Rockies, it is associated with grand fir and western redcedar forests [11,56]. Pacific yew also occasionally grows in warmer subalpine fir (Abies lasiocarpa)-Engelmann spruce communities [11].

Plant associates: Common plant associates in coniferous forests of the northern Rocky Mountains include pachistima (Pachistima myrsinites), northern twinflower (Linnaea borealis), menziesia (Menziesia ferruginea), Rocky Mountain maple (Acer glabrum), blue huckleberry (Vaccinium membranaceum), wild ginger, queencup beadlily, one-sided wintergreen (Pyrola secunda), western rattlesnake plantain (Goodyera oblongifolia), oneleaf foamflower (Tiarella unifoliata), and bunchberry (Cornus canadensis) [6,13,25,81]. In southwestern Oregon and California, vine maple (Acer circinatum), dwarf Oregon grape (Mahonia nervosa), northern twinflower, salal (Gaultheria shallon), and hazel (Corylus cornuta) grow with Pacific yew [6,67,82]. Elsewhere in the Northwest, Pacific rhododendron (Rhododendron macrophyllum), vine maple, salal, western swordfern (Polystichum munitum), Oregon oxalis (Oxalis oregana), Pacific dogwood (Cornus nuttallii), and oceanspray (Holodiscus discolor) are common associates [11].

Climate: Pacific yew grows in cool temperate and mesothermal climates [40,41]. Abundance increases with increasing precipitation and decreases with greater elevation and latitude [40]. Average annual precipitation ranges from 18 to 116 inches (47-294 cm) [11]. Sites are generally characterized by mild wet winters and warm dry summers [14]. Pacific yew is moderately tolerant of frost, but the protection offered by a layer of snow is necessary in continental climates [41]. This plant is resistant to flooding and survives temporary inundation [41].

Soils: Western yew commonly grows on deep, moist, well-drained soils [62,77] and is well adapted to acidic conditions [41]. In British Columbia, it tends to be most productive in alluvial habitats where soils are nutrient-rich [41]. A study conducted in the Bitterroot Mountains of Montana and Idaho indicated that sites dominated by Pacific yew have high levels of nitrogen [51]. Pacific yew grows on soils derived from a variety of parent materials including granite, diorite, gabbro, serpentine, pre-Cambrian metasediments, schists, and gneiss [14,42,67,79].

Elevation: Pacific yew grows at elevations ranging from 2,000 to 8,000 feet (610-2,438 m) [62]. In Oregon, it occurs at low to middle elevations [74], and in British Columbia, it occurs from submontane to subalpine habitats [41]. Elevational ranges by geographic location have been reported as follows:

	Reference
from 3,200 to 7,000 feet (975-2,134 m) in MT	[17]
350 to 4,350 feet (104-1,329 m) in CA	[11]
< 7,000 feet (2,134 m) in CA	[55]
200 to 4,450 feet (60-1,350 m) in OR & WA	[11]

SUCCESSIONAL STATUS :
Pacific yew is present in many climax or near climax communities of the Pacific Northwest and northern Rocky Mountains [9,51,59,81]. It is a particularly common component of old-growth grand fir, western redcedar, and Douglas-fir-western hemlock communities [23,49,51,68]. Pacific yew increases in cover up to a stand age of at least 500 years in northwestern old growth Douglas-fir forests which are characterized by long fire-free intervals [68]. This fire-sensitive species is absent from areas characterized by high fire frequencies.

Pacific yew does occur on disturbed sites, including previously logged stands [11], but reaches greatest abundance in undisturbed areas [19,68]. Plants often grow as suppressed individuals in undisturbed stands [26]. After timber harvest, this residual species expands as the overstory develops [5], but where residual plants have been removed, such as by broadcast burning, plants do not generally develop until a protective overstory canopy has formed [50].

Pacific yew was common in mature stands 230 years or older but was absent in second-growth communities (50- to 80-year-old stands) in Washington [57]. Similarly, it represented 15 to 20 percent cover in various old-growth stands in the northern Rocky Mountains but was rare (1.4 to 2 percent cover) in immature stands (7 to 16 years old and 30 to 90 years old) [2,3,4]. Percent cover of Pacific yew in different aged stands in western hemlock-Douglas-fir forests of the western Cascades was documented as follows [69]:

stand age (years)	2	5	10	15	20	30	40	undist. old growth
% cover	0.05	0.18	0.16	1.51	0.66	2.26	0.49	9.56

Mesic old-growth forests in canyons of the Bitterroot Mountains in Idaho and Montana are commonly dominated by Pacific yew, western redcedar, and/or grand fir [49]. Pacific yew typically establishes after the initial colonization period, and is described as the only "relay" species not colonizing these sites in early seral stages [49]. The ultimate composition of these forests (dominance by Pacific yew, grand fir, or western redcedar) is largely attributable to random events which occur during stand establishment rather than to a sequential replacement process [49,50].

In parts of the northern Rocky Mountains, the short tree, Pacific yew, "expresses climax sociological dominance over tall conifers" such as grand fir [14]. This situation differs from the classical pattern in which progressively taller taxa gradually assume dominance over shorter forms [14]. The successional role of Pacific yew in these forests has been subject to a number of interpretations. However, Pacific yew is generally considered the climax dominant because, in the absence of disturbance, it successfully replaces itself "to the near exclusion of tall conifers" [14]. Evidence suggests that grand fir may be slowly eliminated where Pacific yew is replacing itself successfully [14,34]. "At climax, other tree species occur primarily as a result of gap-phase replacement in the yew canopy and definitely do not have as great an influence on the community as [Pacific yew]" [14]. Gap phase replacement or microsuccession prevents the development of an exclusive canopy of Pacific yew because other conifer seedlings tend to outcompete yew in the canopy openings. Elsewhere, grand fir and other conifer seedlings may be eliminated by dense yew competition [68]. However, on sites where Pacific yew occurs only sporadically, grand fir often reproduces more successfully.

SEASONAL DEVELOPMENT :
Fruit of Pacific yew matures in a single season. Seeds ripen in September and October [30], and the fruit generally falls from the plant in October [77]. Flowering and fruiting has been documented as follows:

Location	Flowering	Fruit ripens	Reference
CA	April-May	----	[55]
n ID	----	August-October	[58]
WA	June	August-October	[65]
Pacific Northwest	April-June	----	[30]

FIRE ECOLOGY

SPECIES: Taxus brevifolia

FIRE ECOLOGY OR ADAPTATIONS :
Pacific yew is susceptible to heat damage and is most often associated with forests characterized by long fire-free intervals. Fire is rare in many old-growth forests of the Pacific Northwest [68]. Fire intervals in forests containing Pacific yew have been estimated as follows:

Location	Fire interval	Reference
Bitterroot Mtns. ID, MT	60 years	[50]
c Western Cascades, OR	100 years	[52]
Siskiyous, OR	20 years	[7]
nw CA - low elev.	500-600 years	[68]
nw CA - mid elev.	150-200 years	[68]

Mature moist-site stands in which Pacific yew grows as scattered individuals are often considered relics from past fires [34]. In parts of the Northwest, stand age ranges from 80 to 250 years where fire intervals average 70 to 120 years [14]. Similarly, in parts of western Montana, the age of Pacific yew averages approximately 210 years where fire replacement cycles are estimated at 150 years [14]. This suggests that the association of Pacific yew with moist microsites conveys some protection from fire.

After fire, Pacific yew slowly reestablishes by means of bird-dispersed seed as the overstory canopy develops.

FIRE REGIMES :
Find fire regime information for the plant communities in which this species may occur by entering the species name in the FEIS home page under "Find Fire Regimes".

POSTFIRE REGENERATION STRATEGY :
Secondary colonizer - offsite seed

FIRE EFFECTS

SPECIES: Taxus brevifolia

IMMEDIATE FIRE EFFECT ON PLANT :
Pacific yew has thin bark and is sensitive to heat damage [14,68]. Plants are generally killed by even light ground fires [49], and this species is almost always eliminated from burned stands [14,50]. In western Montana, Stickney [73] observed that all plants were eliminated from burned stands. An abundance of Pacific yew can be equated with an absence of fire [14].

Plants which occasionally survive fire do so because they occur in the wettest concavities which are relatively unaffected by fire [7].

DISCUSSION AND QUALIFICATION OF FIRE EFFECT :
NO-ENTRY

PLANT RESPONSE TO FIRE :
Pacific yew reoccupies burned areas through bird-dispersed off-site seed. Although vegetative regeneration is possible after mechanical disturbance, Pacific yew's susceptibility to heat damage makes postfire sprouting unlikely or impossible.

This plant may require shelter provided by other species for reestablishment [50] and typically recovers slowly. Hofman [31] observed that seedling germination was delayed for at least 6 years after a hot slash burn in northern Idaho. Pacific yew is rare on recently burned sites, even where it was a common component of preburn communities [18,20,71]. In a northern Idaho study, Pacific yew was present on 80 percent of the preburn plots but was absent from all plots during the first years after fire [72,73]. In parts of the northern Rocky Mountains, it is described as the "only principal residual species eliminated by fire" [73].

DISCUSSION AND QUALIFICATION OF PLANT RESPONSE :
NO-ENTRY

FIRE MANAGEMENT CONSIDERATIONS :
Fire history: Because of its sensitivity to fire, the age of Pacific yew can be used to estimate minimum stand age [49]. However, because it establishes after initial colonization, the oldest stem is often significantly younger than the age of the stand itself [49].

Prescribed fire: Johnson and Simon [34] recommend against prescribed fire in Pacific yew types. Although a light underburn will not damage the duff layer, yew may be adversely affected. Scher and Jimerson [68] note that "although prescribed burning reduces the probability of catastrophic wildfires, precautions must be exercised to maintain biodiversity by protecting temperature-sensitive species" such as Pacific yew. In some areas, prescribed and/or wildfires can contribute to the depletion of yew populations [68]. Broadcast burning after clearcutting has virtually eliminated yew in some areas [61,68].

REFERENCES

SPECIES: Taxus brevifolia

REFERENCES :

1. Anon. 1990. News Briefs. Journal of Forestry. 88(10): 9. [12454]

2. Antos, Joseph Avery. 1977. Grand fir (Abies grandis (Dougl.) Forbes) forests of the Swan Valley, Montana. Missoula, MT: University of Montana. 220 p. Thesis. [6720]

3. Antos, J. A.; Habeck, J. R. 1981. Successional development in Abies grandis (Dougl.) Forbes forests in the Swan Valley, western Montana. Northwest Science. 55(1): 26-39. [12445]

4. Antos, Joseph A.; Shearer, Raymond C. 1980. Vegetation development on disturbed grand fir sites, Swan Valley, northwestern Montana. Res. Pap. INT-251. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 26 p. [7269]

5. Arno, Stephen F.; Hammerly, Ramona P. 1977. Northwest trees. Seattle, WA: The Mountaineers. 222 p. [4208]

6. Atzet, Thomas. 1979. Description and classification of the forests of the upper Illinois River drainage of southwestern Oregon. Corvallis, OR: Oregon State University. 211 p. Dissertation. [6452]

7. Atzet, Thomas; Wheeler, David L. 1982. Historical and ecological perspectives on fire activity in the Klamath Geological Province of the Rogue River and Siskiyou National Forests. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 16 p. [6252]

8. Atzet, Thomas; Wheeler, David L. 1984. Preliminary plant associations of the Siskiyou Mountain Province. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 278 p. [9351]

9. Bailey, Arthur Wesley. 1966. Forest associations and secondary succession in the southern Oregon Coast Range. Corvallis, OR: Oregon State University. 166 p. Thesis. [5786]

10. Bernard, Stephen R.; Brown, Kenneth F. 1977. Distribution of mammals, reptiles, and amphibians by BLM physiographic regions and A.W. Kuchler's associations for the eleven western states. Tech. Note 301. Denver, CO: U.S. Department of the Interior, Bureau of Land Management. 169 p. [434]

11. Bolsinger, Charles L.; Minore, Don; Radwan, M. A.; [and others]. 1988. Pacific yew (Taxus brevifolia Nutt.)--a research prospectus. Unpublished paper on file at: U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Fire Sciences Laboratory, Missoula, MT. 13 p. [12591]

12. Conover, M. R.; Kania, G. S. 1988. Browsing preference of white-tailed deer for different ornamental species. Wildlife Society Bulletin. 16: 175-179. [8933]

13. Cooper, Stephen V.; Neiman, Kenneth E.; Steele, Robert; Roberts, David W. 1987. Forest habitat types of northern Idaho: a second approximation. Gen. Tech. Rep. INT-236. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 135 p. [867]

14. Crawford, Rex C.; Johnson, Frederic D. 1985. Pacific yew dominance in tall forests, a classification dilemma. Canadian Journal of Botany. 63: 592-602. [3043]

15. Dayton, William A. 1931. Important western browse plants. Misc. Publ. 101. Washington, DC: U.S. Department of Agriculture. 214 p. [768]

16. del Moral, Roger; Cates, Rex G. 1971. Allelopathic potential of the dominant vegetation of western Washington. Ecology. 52(6): 1030-1037.

[4794]

17. Dittberner, Phillip L.; Olson, Michael R. 1983. The plant information network (PIN) data base: Colorado, Montana, North Dakota, Utah, and Wyoming. FWS/OBS-83/86. Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service. 786 p. [806]

18. Dyrness, C. T. 1965. The effect of logging and slash burning on understory vegetation in the H. J. Andrews Experimental Forest. Res. Note PNW-31. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 13 p. [4939]

19. Dyrness, C. T. 1973. Early stages of plant succession following logging and burning in the western Cascades of Oregon. Ecology. 54(1): 57-69. [7345]

20. Edgerton, Paul J. 1987. Influence of ungulates on the development of the shrub understory of an upper slope mixed conifer forest. In: Provenza, Frederick D.; Flinders, Jerran T.; McArthur, E. Durant, compilers. Proceedings--symposium on plant-herbivore interactions; 1985 August 7-9; Snowbird, UT. Gen. Tech. Rep. INT-222. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station: 162-167. [7411]

21. Everett, Percy C. 1957. A summary of the culture of California plants at the Rancho Santa Ana Botanic Garden 1927-1950. Claremont, CA: The Rancho Santa Ana Botanic Garden. 223 p. [7191]

22. Eyre, F. H., ed. 1980. Forest cover types of the United States and Canada. Washington, DC: Society of American Foresters. 148 p. [905]

23. Franklin, Jerry F.; DeBell, Dean S. 1988. Thirty-six years of tree population change in an old-growth Pseudotsuga- Tsuga forest. Canadian Journal of Forest Research. 18: 633-639. [8769]

24. Garrison, George A.; Bjugstad, Ardell J.; Duncan, Don A.; [and others]. 1977. Vegetation and environmental features of forest and range ecosystems. Agric. Handb. 475. Washington, DC: U.S. Department of Agriculture, Forest Service. 68 p. [998]

25. Habeck, James R. 1972. Fire ecology investigations in Selway-Bitterroot Wilderness, historical considerations and current observations. Contract No. 26-2647, Publication No. R1-72-001. Missoula, MT: University of Montana, Department of Botany. 119 p. [7848]

26. Halpern, C. B. 1989. Early successional patterns of forest species: interactions of life history traits and disturbance. Ecology. 70(3): 704-720. [6829]

27. Hartesveldt, Richard J.; Harvey, H. Thomas; Shellhammer, Howard S.; Stecker, Ronald E. 1975. The sequoia of the Sierra Nevada. Washington, DC: U.S. Department of the Interior, National Park Service. 180 p. [4233]

28. Heit, C. E. 1969. Propagation from seed - part 18. American Nurseryman. 129(2): 10-11, 118-128. [12515]

29. Hitchcock, C. Leo; Cronquist, Arthur. 1973. Flora of the Pacific Northwest. Seattle, WA: University of Washington Press. 730 p. [1168]

30. Hitchcock, C. Leo; Cronquist, Arthur; Ownbey, Marion. 1969. Vascular plants of the Pacific Northwest. Part 1: Vascular cryptograms, gymnosperms, and monocotyledons. Seattle, WA: University of Washington Press. 914 p. [1169]

31. Hofmann, J. V. 1917. Natural reproduction from seed stored in the forest floor. Journal of Agricultural Research. 11(1): 1-26. [12446]

32. Hosie, R. C. 1969. Native trees of Canada. 7th ed. Ottawa, ON: Canadian Forestry Service, Department of Fisheries and Forestry. 380 p. [3375]

33. Huang, C. H. Oliver; Kingston, David G. I.; Magri, Neal F.; Samaranayake, G. 1986. New taxanes from Taxus brevifolia, 2. Journal of Natural Products. 49(4): 665-669. [12513]

34. Johnson, Charles G., Jr.; Simon, Steven A. 1987. Plant associations of the Wallowa-Snake Province: Wallowa-Whitman National Forest. R6-ECOL-TP-255A-86. Baker, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest. 399 p. [9600]

35. Juliano, C.; Monaco, G.; Rubino, S.; Cappuccinelli, P. 1986. Inhibition of Tirchomonas vaginalis replication by the microtubule stabilizer taxol. Journal of Protozoology. 33(2): 255-260. [12511]

36. Kartesz, John T.; Kartesz, Rosemarie. 1980. A synonymized checklist of the vascular flora of the United States, Canada, and Greenland. Volume II: The biota of North America. Chapel Hill, NC: The University of North Carolina Press; in confederation with Anne H. Lindsey and C. Richie Bell, North Carolina Botanical Garden. 500 p. [6954]

37. Kingsbury, John M. 1964. Poisonous plants of the United States and Canada. Englewood Cliffs, NJ: Prentice-Hall, Inc. 626 p. [122]

38. Kingston, David G. I.; Hawkins, Douglas R.; Ovington, Liza. 1982. New taxanes from Taxus brevifolia. Journal of Natural Products. 45(4): 466-470. [12512]

39. Kingston, David G. I.; Samaranayake, G.; Ivey, C. A. 1990. The chemistry of taxol, a clinically useful anticancer agent. Journal of Natural Products. 53(1): 1-12. [12514]

40. Klinka, K.; Krajina, V. J.; Ceska, A.; Scagel, A. M. 1989. Indicator plants of coastal British Columbia. Vancouver, BC: University of British Columbia Press. 288 p. [10703]

41. Krajina, V. J.; Klinka, K.; Worrall, J. 1982. Distribution and ecological characteristics of trees and shrubs of British Columbia. Vancouver, BC: University of British Columbia, Department of Botany and Faculty of Forestry. 131 p. [6728]

42. Kruckeberg, A. R. 1982. Gardening with native plants of the Pacific Northwest. Seattle: University of Washington Press. 252 p. [9980]

43. Kuchler, A. W. 1964. Manual to accompany the map of potential vegetation of the conterminous United States. Special Publication No. 36. New York: American Geographical Society. 77 p. [1384]

44. Legha, Sewa S.; Ring, Sigrid; Papadopoulos, Nicholas; Raber, Martin; Benjamin, Robert S. 1990. A phase II trial of taxol in metastatic melanoma. Cancer. 65(11): 2478-2481. [12492]

45. Little, Elbert L., Jr. 1971. Atlas of the United States trees. Volume 1. Conifers and important hardwoods. Misc. Publ. 1146. Washington, DC: U.S. Department of Agriculture, Forest Service. 320 p. [1462]

46. Little, Elbert L., Jr. 1979. Checklist of United States trees (native and naturalized). Agric. Handb. 541. Washington, DC: U.S. Department of Agriculture, Forest Service. 375 p. [2952]

47. Lyon, L. Jack; Stickney, Peter F. 1976. Early vegetal succession following large northern Rocky Mountain wildfires. In: Proceedings, Tall Timbers fire ecology conference and Intermountain Fire Research Council fire and land management symposium; 1974 October 8-10; Missoula, MT. No. 14. Tallahassee, FL: Tall Timbers Research Station: 355-373. [1496]

48. Mannan, Robert William. 1977. Use of snags by birds, Douglas-fir region, Western Oregon. Corvallis, OR: Oregon State University. 114 p. Thesis. [9896]

49. McCune, Bruce. 1983. Fire frequency reduced two orders of magnitude in the Bitterroot Canyons Montana. Canadian Journal of Forest Research. 13: 212-218. [12712]

50. McCune, B.; Allen, T. F. H. 1985. Forest dynamics in the Bitterroot Canyons, Montana. Canadian Journal of Botany. 63: 377-383. [12451]

51. McCune, B.; Allen, T. F. H. 1985. Will similar forest develop on similar sites?. Canadian Journal of Botany. 63: 367-376. [12450]

52. Means, Joseph E. 1982. Developmental history of dry coniferous forests in the central western Cascade Range of Oregon. In: Means, Joseph E., ed. Forest succession and stand development research in the Northwest: Proceedings of a symposium; 1981 March 26; Corvallis, OR. Corvallis, OR: Forest Research Laboratory, Oregon State University: 142-158. [1627]

53. Minore, Don. 1972. A classification of forest environments in the South Umpqua Basin. Res. Pap. PNW-129. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 28 p. [1660]

54. Mitchell, Rod; Moir, Will. 1976. Vegetation of the Abbott Creek Research Natural Area, Oregon. Northwest Science. 50(1): 42-58. [1664]

55. Munz, Philip A. 1973. A California flora and supplement. Berkeley, CA: University of California Press. 1905 p. [6155]

56. Neiman, K. E., Jr. 1988. Synecology of western redcedar in the northern rocky mountains. In: Smith, N. J., ed. Western red cedar--does it have a future?; [Date of conference unknown]; [Location of conference unknown]. Vancouver, BC: University of British Columbia, Faculty of Forestry: 114-121. [6704]

57. Ossinger, Mary C. 1983. The Pseudotsuga-Tsuga/Rhododendron community in the northeast Olympic Mountains. Bellingham, WA: Western Washington University. 50 p. Thesis. [11435]

58. Patterson, Patricia A.; Neiman, Kenneth E.; Tonn, Jonalea. 1985. Field guide to forest plants of northern Idaho. Gen. Tech. Rep. INT-180. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 246 p. [1839]

59. Peet, Robert K. 1988. Forests of the Rocky Mountains. In: Barbour, Michael G.; Billings, William Dwight, eds. North American terrestrial vegetation. Cambridge; New York: Cambridge University Press: 63-101. [6714]

60. Pierce, John D. 1984. Shiras moose forage selection in relation to browse availability in north-central Idaho. Canadian Journal of Zoology. 62(12): 2404-2409. [12493]

61. Pierce, D. John; Peek, James M. 1984. Moose habitat use and selection patterns in north-central Idaho. Journal of Wildlife Management. 48(4): 1334-1343. [12516]

62. Preston, Richard J., Jr. 1948. North American trees. Ames, IA: The Iowa State College Press. 371 p. [1913]

63. Raunkiaer, C. 1934. The life forms of plants and statistical plant geography. Oxford: Clarendon Press. 632 p. [2843]

64. Rice, Elroy L. 1974. Allelopathy. New York: Academic Press, Inc. 353 p. [3317]

65. Rudolf, Paul O. 1974. Taxus L. yew. In: Schopmeyer, C. S., ed. Seeds of woody plants in the United States. Agric. Handb. 450. Washington, DC: U.S. Department of Agriculture, Forest Service: 799-802. [7763]

66. Sampson, Arthur W.; Jespersen, Beryl S. 1963. California range brushlands and browse plants. Berkeley, CA: University of California, Division of Agricultural Sciences, California Agricultural Experiment Station, Extension Service. 162 p. [3240]

67. Sawyer, John O.; Thornburgh, Dale A.; Griffin, James R. 1977. Mixed evergreen forest. In: Barbour, Michael G.; Major, Jack, eds. Terrestrial vegetation of California. New York: John Wiley and Sons: 359-381. [7218]

68. Scher, Stanley; Jimerson, Thomas M. 1989. Does fire regime determine the distribution of Pacific yew in forested watersheds. In: Berg, Neil H., technical coordinator. Proceedings of the symposium on fire and watershed management; 1988 October 26-28; Sacramento, CA. Gen. Tech. Rep. PSW-109. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station: 160-161. [8994]

69. Schoonmaker, Peter; McKee, Arthur. 1988. Species composition and diversity during secondary succession of coniferous forests in the western Cascade Mountains of Oregon. Forest Science. 34(4): 960-979. [6214]

70. Standley, Paul C. 1921. Flora of Glacier National Park, Montana. Contributions from the United States National Herbarium. Vol. 22, Part 5. Washington, DC: United States National Museum, Smithsonian Institution: 235-438. [12318]

71. Steen, Harold K. 1966. Vegetation following slash fires in one western Oregon locality. Northwest Science. 40(3): 113-120. [5671]

72. Stickney, Peter F. 1980. Data base for post-fire succession, first 6 to 9 years, in Montana larch-fir forests. Gen. Tech. Rep. INT-62. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 133 p. [6583]

73. Stickney, Peter F. 1981. Vegetative recovery and development. In: DeByle, Norbert V., ed. Clearcutting and fire in the larch/Douglas-fir forests of western Montana--a multifaceted research summary. Gen. Tech. Rep. INT-99. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station: 33-40. [7609]

74. Topik, Christopher; Hemstrom, Miles A., compilers. 1982. Guide to common forest-zone plants: Willamette, Mt. Hood, and Siuslaw National Forests. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 95 p. [3234]

75. Turner, Nancy J. 1988. Ethnobotany of coniferous trees in Thompson and Lillooet Interior Salish of British Columbia. Economic Botany. 42(2): 177-194. [4542]

76. U.S. Department of Agriculture, Soil Conservation Service. 1982. National list of scientific plant names. Vol. 1. List of plant names. SCS-TP-159. Washington, DC. 416 p. [11573]

77. Van Dersal, William R. 1938. Native woody plants of the United States, their erosion-control and wildlife values. Washington, DC: U.S. Department of Agriculture. 362 p. [4240]

78. Waring, R. H. 1969. Forest plants of the eastern Siskiyous: their environment and vegetational distribution. Northwest Science. 43(1): 1-17. [9047]

79. Whittaker, R. H. 1960. Vegetation of the Siskiyou Mountains, Oregon and California. Ecological Monographs. 30(3): 279-338. [6836]

80. Wilke, Philip J. 1988. Bow staves harvested from juniper trees by Indians of Nevada. Journal of California and Great Basin Anthropology. 10(1): 3-31. [10870]

81. Zamora, Benjamin Abel. 1975. Secondary succession on broadcast-burned clearcuts of the Abies grandis - Pachistima myrsinites habitat type in northcentral Idaho. Pullman, WA: Washington State University. 127 p. Dissertation. [5154]

82. Atzet, Tom; Wheeler, David; Smith, Brad; [and others]. 1984. The tanoak series of the Siskiyou Region of southwest Oregon. Forestry Intensified Research [Oregon State University]. 6(3): 6-7. [8593]

83. Atzet, Thomas; McCrimmon, Lisa A. 1990. Preliminary plant associations of the southern Oregon Cascade Mountain Province. Grants Pass, OR: U.S. Department of Agriculture, Forest Service, Siskiyou National Forest. 330 p. [12977]

FEIS Home Page